Binned (IMLIMAGE) Science Data Packet

1. Number of Valid Events, Species 1 Start TOF, Species Stop TOF, Species Start TOF, and Species 2 Stop TOF, only Chris's version of the UDF-DLM can access these data.
2. LENA Image Distortion Recovery, see Michael Collier's White Paper, December 5, 2001

Event (IMLEVENT) Science Data Packet

1. To convert Chris's UDF start/stop phase angle to spin sector

d.stop_az and d.start_az are from the udf_read via udf-dlm

```
;-------------------------------------------------
; determine the center phase angle
; algorithm from Chris Gurgiolo
;-------------------------------------------------

delta_angle = d.stop_az[0] - d.start_az[0]
udf_angle = d.stop_az[0] + d.start_az[0]

if (delta_angle gt 0.0) then begin
   udf_phase_angle = udf_angle/2.0
endif else begin
   udf_phase_angle = (360.0 + udf_angle)/2.0
   udf_phase_angle = udf_phase_angle mod 360.0
endelse

;-------------------------------------------------
; convert the UDF phase angle into spin sector
; algorithm from Michael Collier
;-------------------------------------------------
if (udf_phase_angle ge 225.1) then begin
  az[indx]  = fix((udf_phase_angle - 225.1)/8.)
endif else begin
  if (udf_phase_angle lt 225.1) then begin
```

```
      az[indx]  = fix((udf_phase_angle + 134.9)/8.)
    endif
  endelse

  if (az[indx] eq 45) then az[indx] = 0
```

2. In the UDF data, there are cases where there are no events for a given spin sector, Chris uses the following to indicate that

   if (TOF eq 3) AND (POLAR eq 12) AND (ENERGY eq 0) then
   this means there were no events in that sector

Singles (IMLSNGLS) Science Data Packet

This may or may not be useful since the UDF handles this, but just in case… The singles data are floating point and is stored as 2 bytes, a 12 bit mantissa and a 4 bit exponent. The 4 MSB bits represent the exponent.

exponent 0 = no decoding required. Use straight mantissa
exponent 1 = multiply mantissa by 16
exponent 2 = multiply mantissa by 256
exponent 3 = multiply mantissa by 4096

Sectored Events/Sun Pulse (IMLEVSP) Data Segment

1. Sun Pulse Sector conversion from counts to sector

if sun_pulse_sector = 2674

sun pulse relative to LENA frame of reference = 2674/10 = 267.4
sun pulse relative to IMAGE frame of reference = 267.4 + 135 = 402.4 mod 360 = 42.4 (deg)

2674 + 1350 = 4024
4024 mod 3600 = 424 This gives sun pulse location in IMAGE frame.
424/3600 = .11777 This gives fraction of circle.
...11777 * 45 = 5.3 If you want to identify the sector, this is ok (assumes sector 0 is the first sector)

To get the angle, multiply the fraction of the circle by 360. 0.11777 * 360 = 42.4 deg.

2. July 31, 2000 - October 16, 2000, this packet was not available. See Data Read Housekeeping Section in this document for data layout.

Housekeeping (IMLHSKP) Data Packet

1. Temperature 2, is not a temperature, stores the HV monitor value
2. Temperature 7 is used as a flag to indicate if the packets during the July 31, 2000 - October 16, 2000 period were sent in the Data Read. One equals data sent. Zero equals no data sent.

Data Read Housekeeping (IMLMEMD) Data Packet

1. The start_addr and byte_or_word_xfer | byte_count, only Chris's udf-dlm version can read these data.
2. Temperature 7 in the IMLHSKP indicates that the new packets (ROI Summation, Sectored Events, HK Monitor) are included. If the value in MEMD byte 13 is 0, there is no MEMD data and the new packets begin at byte 15. If the value in byte 13 is greater than zero, then there are that many MEMD data bytes and then the new packets follow in this order:

    ROI Summation (IMLROISM) - 20 bytes
    Sectored Events (IMLEVSP) - 92 bytes
    HK Monitor (IMLSGMON) - 41 bytes

Command Record Housekeeping (IMLECHO) Data Packet

How to interpret the list of commands sent from the UDF data. You will need the IMAGE/LENA Command Definitions Tables, Document No. 0600-692-01.

From the UDF-DLM, the num_commands_executed indicates the number of commands that were sent to LENA.

The telecommand_echo stores the list of commands in a 256 byte buffer.

There are opcodes and parameters. The following opcodes correspond to the following command tables:

Opcode	Command
9A	System Commands
D2	ROI Commands
56	Performance Commands
A5	HVPS Commands
B6	TOF Commands
C7	PSS Commands
E9	Memory Commands

For example,

Given num_commands_executed = 2
Given telecommand_echo = A580A56091

Based on the first byte, the opcode, which is A5, it corresponds to the HVPS commands. Byte 2 indicates 80. In the HVPS Command table, the 80 parameter is searched in the Definitions Tables. The parameter corresponds to the MCP Start HV Power Supply. Since this command was sent, it was enabled. This is the first command.

There is a second command. Byte 3 shows A5 which corresponds to the HVPS Command Table. The parameter 60 in the Definition Table indicates that it is the MCP Start HV power supply. This parameter also indicates that a value follows; therefore, byte 5, 91, is the MCP Start HV power supply value that was sent.

In general…..

1. Time tags from each of the UDF packets may or may not be the same. Let's say if you wanted day of year 90 in 2001 at time 00:00:00, each of the science or housekeeping packets may begin with a different time.

When using more than one packet, you need to sync the data by time first. For example, time tags in EVENT packets have higher resolution than the other packets.

2. The spacecraft clock drifts, Chris handles this in his UDF so his times are already clock drift corrected. If you use the Level 0 data, you need to do this correction yourself.